EOS Microwave Limb Sounder
A short guide to the use and interpretation of v1.5 Level 2 data.

JPL

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Introduction

This document is a brief guide for those wishing to use Level 2 data (geophysical products along the measurement track) produced by the version 1.5 data processing algorithms for the Microwave Limb Sounder (MLS) on the Aura spacecraft. Bear in mind that, at the time of writing, these data are considered *not validated*. Those wishing to use data must contact the MLS science team concerning their intended use. Feedback to the MLS team on features found in the data is encouraged.

A full data quality document will be distributed when the data are released to the wider scientific community. This interim document is aimed at those obtaining data directly from the MLS team or from the Aura Validation Data Center (AVDC).

How do I read MLS Level 2 data?

The MLS Level 2 data are stored in the Aura-specific implementation of the HDF-EOS (v5) format, as described in the *HDF-EOS Aura File Format Guidelines*[1]. Briefly, the MLS standard products are stored in individual *Level 2 Geophysical Product* files (`L2GP`) within appropriately named swaths. The files contain vertical profiles of geophysical parameters on a fixed set of pressures (typically spaced at 6 surfaces per decade change in pressure). A simple read function for the IDL language (IDL version 6.0 or later required) called `readl2gp.pro` may have been supplied to you with the data. The meaning of most fields is obvious from their names. The field `time` records the number of seconds elapsed since midnight universal time on January 1, 1993 (including 5 subsequent leap seconds).

Which data points do I avoid?

Individual MLS data values for a product are stored in the `L2gpValue` field, while `L2gpPrecision` describes the estimated precision of each data point.

- Data points that have not been measured with useful precision have the `L2gpPrecision` field set negative and *must not be used*.

In addition two other fields in the swath must be consulted: `status` and `quality`.

- Profiles where `status` is an odd number (bit 0 is set) *must not be used*.

- Profiles where `status` is non-zero should be approached with caution. Such data may have been affected by the presence of dense clouds.

- The `quality` field describes the quality of each profile (based on the achieved fit to the MLS radiance observations). Lower values for certain profiles indicate poorer quality data (differences from product to product carry no significance).

- Remember, these data are currently *not validated*. In particular, no formal statement of the accuracy of the products has yet been made.

- Table 1 overleaf details the useful vertical range and the MLS team contact(s) for each product.

How do I interpret the data?

The MLS data describe a piecewise linear representation of vertical profiles of mixing ratio / temperature, with the tie points given in the `L2GP` files (piecewise linear in log mixing ratio for H_2O). This contrasts with most other instruments which report profiles of layer means, and necessitates special attention when comparing MLS data to other observations. This will be described in more detail in the v1.5 data quality document.

Some of the MLS observations are 'noisy' in nature. A consequence of this is that negative mixing ratios are often reported. These *should not be masked or ignored*, as failure to include them will lead to a positive bias in averages made using MLS data.

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[1] http://www.eos.ucar.edu/hirdls/HDFEOS_Aura_File_Format_Guidelines.pdf

Table 1: Information concerning each MLS standard product. Products marked with a * require significant averaging (such as monthly zonal means) over most or all of their vertical range in order to yield a useful signal to noise ratio. All standard product files for species abundances also contain estimated column loading above the tropopause (WMO definition) determined from the MLS temperature data.

Product	Swath name	Useful range	Contact name	Contact Email
BrO*	BrO	10 − 2.2 hPa	Nathaniel Livesey	livesey@mls.jpl.nasa.gov
ClO	ClO	100 − 1.0 hPa	Michelle Santee	mls@mls.jpl.nasa.gov
CO	CO	215 − 0.0022 hPa	Mark Filipiak	M.J.Filipiak@ed.ac.uk
H_2O	H2O	316 − 0.1 hPa	William Read (trop.)	bill@mls.jpl.nasa.gov
			Hugh Pumphrey (strat./mes.)	H.C.Pumphrey@ed.ac.uk
HCl	HCl	100 − 0.22 hPa	Lucien Froidevaux	lucien@mls.jpl.nasa.gov
HCN	HCN	10 − 1.4 hPa	Hugh Pumphrey	H.C.Pumphrey@ed.ac.uk
HNO_3	HNO3	147 − 4.6 hPa	Michelle Santee	mls@mls.jpl.nasa.gov
HO_2*	HO2	46 − 0.22 hPa	Herbert Pickett	hmp@mls.jpl.nasa.gov
HOCl*	HOCl	10 − 2.2 hPa	Lucien Froidevaux	lucien@mls.jpl.nasa.gov
N_2O	N2O	100 − 0.1 hPa	Nathaniel Livesey	livesey@mls.jpl.nasa.gov
O_3	O3	215 − 0.1 hPa	Mark Filipiak (trop.)	M.J.Filipiak@ed.ac.uk
			Lucien Froidevaux (strat./mes.)	lucien@mls.jpl.nasa.gov
OH*	OH	46 − 0.001 hPa	Herbert Pickett	hmp@mls.jpl.nasa.gov
Temperature[a]	Temperature	316 − 0.001 hPa	Michael Schwartz	michael@mls.jpl.nasa.gov
Geopotential height	GPH	316 − 0.001 hPa	Michael Schwartz	michael@mls.jpl.nasa.gov
Relative Humidity with respect to ice[b]	RHI	316 − 0.1 hPa	William Read	bill@mls.jpl.nasa.gov
Ice Water Content[c]	IWC	215 − 46 hPa	Dong Wu	dwu@mls.jpl.nasa.gov
			Jonathan Jiang	jonathan@mls.jpl.nasa.gov

[a]File also contains estimate of tropopause pressure (WMO definition) inferred from MLS temperatures.
[b]Computed from the H_2O and Temperature data.
[c]This product has a reporting grid spaced at 12 surfaces per decade change in pressure.